Owner's Manual

DE1200 Modem

Kantronics

RF Data Communications Specialists

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1202 E. 23rd Street, Lawrence, Kansas 66046
Order number (913) 842-7745
Service number (913) 842-4476
BBS number (913) 842-4678
9 am - noon, 2 pm - 5 pm Central Time, Monday-Friday

We have attempted to make this manual technically and typographically correct as of the date of the current printing. Production changes to the DE1200 may add errata or addendum sheets. We solicit your comments and/or suggested corrections. Please send to Kantronics Co., Inc., 1202 E 23rd Street, Lawrence, KS 66046.

Printed in the U.S.A.

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Limited Warranty

Kantronics Company, Inc. warrants to the first consumer purchaser, for a period of one year from the date of purchase, that this product will be free from defects in material and workmanship, and agrees that it will, at its option, repair or replace the defective parts or the product at no charge for parts or labor.

This warranty does not apply to the cosmetic appearance of the product, or to any product that has been subject to misuse, abuse, overvoltage, or other cause beyond our reasonable control.

This warranty does not apply to any unit that has been modified by the consumer unless specifically authorized by Kantronics Company, Inc, in writing.

In no event shall Kantronics be held liable for damages due to fire, flood, civil disobedience, riot, acts of God or damages incurred in shipping due to poor packaging. Kantronics shall not be held liable in the event the defect is found to be caused by improper parameter settings which are cleared by performing a hard reset.

Kantronics shall not be liable for any incidental or consequential damages arising from the use of the product or due to the non-availability for use of the product under any circumstances.

Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

In order to enforce the rights under this limited warranty, the purchaser should mail, ship or carry the product, together with proof of purchase, to Kantronics Company, Inc, 1202 East 23rd Street, Lawrence, Kansas 66046. The consumer must also provide adequate proof of purchase indicating the date the product was purchased.

There are no other warranties, including the implied warranty of fitness for a particular purpose, not specified herein with regards to this product. Neither the sales personnel of the seller nor any other person is authorized to make any warranties other than those described herein, or to extend the duration of any warranties beyond the time period described above.

This warranty is not assignable by the original consumer. Any attempt to assign or transfer any of the rights, duties or obligations hereof is void.

Any product returned for warranty service and our inspection and testing shall determine no defect exists which is covered by this warranty, shall be charged a minimum of one-half hour labor plus return shipping charges.

This warranty gives you specific legal rights and you may also have other rights which vary from State to State.

Return/Repair Procedures

Consult the limited warranty policy in this manual for the service provisions offered by Kantronics at no charge. This warranty is considered to be in force only when the customer has submitted his completed warranty registration within 10 days of purchase, and when the stipulations of the warranty have been met. Violations of warranty clauses will automatically void the warranty and service or repairs will be charged to the owner.

Service outside the warranty will be charged at the cost of parts, labor, and return shipping. Units returned for service without a Return Authorization number will be subject to a minimum charge of 1/2 hour labor plus shipping and handling. Contact the Service Department (913-842-4476) to obtain a Return Authorization number. Repaired units will be returned via UPS C.O.D. These C.O.D. charges can be avoided by including your VISA or MasterCard number with your unit to be repaired. Shipping and repair may then be charged.

When service or repairs appear necessary, it may be wise to call or write Kantronics to determine if the problem can be solved without returning the unit. Should you encounter difficulty in getting your Modem to operate, you may wish to perform some limited checks before calling or writing. Carefully check to be sure the Modem is properly seated. Also check the setting of your MODEM command.

When calling, report the product name and ask for the Amateur Radio Service Department. Should you find it necessary to call for assistance, please have available the unit name and serial number (the serial number is found on the Modem header.)

The Service Department telephone hours are 9 am - noon and 2 pm - 5 pm Central Time 913-842-4476, Monday through Friday.

When writing, include a clear description of the problem, unit name, computer type, computer software used and if possible a DISPLAY listing from the TNC.

Returns to the factory for refund or exchange are strictly regulated. Any return for refund or exchange must be approved by the service department.

Radio Frequency Interference Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital Device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiated radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced Radio/TV technician for help.

The user is cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RFI Suppression

In moving to the world of digital communications via computers, a new dimension of RFI may be encountered. In spite of the equipment manufacturers' diligence, each new piece of electronic equipment will react differently in each separate environment. Every amateur station will have its own unique layout, equipment variation, and antenna installations. Experience has shown that these differences are related to the total RF environment, and may be causative factors in RFI induced problems. The suggestions given here may assist in resolving RFI problems you may encounter in your "unique" station.

1. Use shielded cable for all connections between equipment.

2. Make all interconnecting cables as short as practical. A balance should be maintained between cable length and equipment proximity. At times simply moving the video monitor one foot further from an interface or other device will solve the "screen hash" problem.

3. Antenna runs should be kept away from equipment control lines and/or interconnecting cables. If it is necessary for such lines to cross each other they should do so at 90 degree angles.

4. Ground leads should be as short as possible and go to a GOOD EARTH GROUND.

5. Interconnecting cables appearing to act as radiators or antennas should be looped through a toroid. Be certain toroids, if used, are designed for the frequency in use.

General

The DE1200 modem is a VHF ready, 1200 baud packet modem, using standard 1200 and 2200 Hertz tones for mark and space. Unlike the Data Engine PC board, the DE1200 is NOT a four-layer board, so you may modify the DE1200 board with standard PC board techniques.

The DE1200 incorporates jumpers for selecting AFSK output level, equalization, hand-held interfacing, and disabling the watchdog timer. Another feature of the DE1200 provides for V.23 compatability by installing a single jumper. The DE1200 is capable of full duplex operation, if your radio link also supports full duplex.

The three carrier detect methods are selected by using the MODEM command in your Data Engine, allowing personal preferences for Data Carrier Detection (DCD).

Installation of the DE1200 Modem

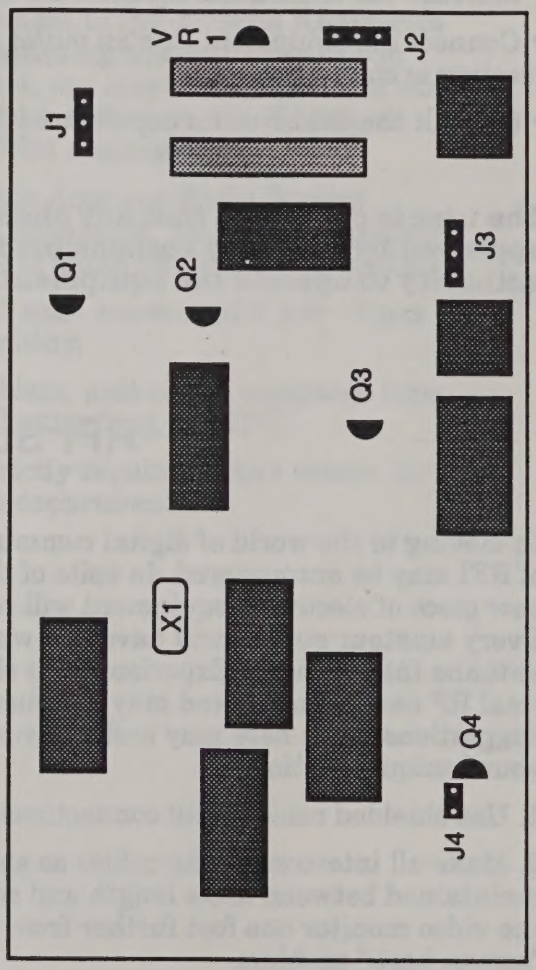
To install your DE1200 modem in the Data Engine, you will need to disassemble the Data Engine. Refer to the Data Engine manual for details.

After the Data Engine PC board is removed from the case, place the circuit board on a static-free surface with the LEDs facing you. Near the back of the unit, there are two 20 pin disconnect headers just in front of each DB-15 connector. As you face the front of the unit, the two headers on the right are for port 1 and the two on the left are for port 2.

Carefully align the plugs on the bottom of the DE1200 board with the pins on the appropriate disconnect headers and seat the modem firmly on the headers.

Install the two screws through the DE1200 board into the standoffs on the Data Engine PC board to secure the modem in place.

Carefully reassemble the Data Engine as described in the Data Engine manual.



DE1200 Modem board viewed as installed in Data Engine, with lights facing you.

Connecting to Your Radio

When installed on the modem disconnect headers, the DE1200 configures the rear panel DB-15 connector according to the following chart.

DB-15 pin	Function
1	PTT – Applies a ground when transmitting
2	Receive audio – Audio from your radio
3	AFSK – Audio from the Data Engine to the radio
8	DCD – External carrier detect (if desired)
9	Ground – Receive audio return lead
10	Ground – AFSK return lead
11	Ground – Common ground to radio

NOTE

All grounds on the Data Engine are common, and are not all required to be connected.

The DE1200 Modem is set for no equalization as required when using audio directly from the discriminator of your radio. If you are using audio from an external speaker jack refer to the "Equalization" section of this manual.

A typical connection to a VHF radio when using the DE1200 modem would be:

Pin 1 from the Data Engine DB-15 to your radio PTT input (STBY)

Pin 2 from the Data Engine DB-15 to the external speaker jack or discriminator output from your radio

Pin 3 from the Data Engine DB-15 to the mic input of your radio

Pin 8 normally would not be connected

Pin 11 from the Data Engine DB-15 connects to the ground of your radio

DB-15 Connector

Male (Looking at Pins)

Female (Looking at Holes)

AFSK Output Level

The DE1200 modem is shipped with the audio output level set for 50 millivolts p-p. This is the proper drive level for the dvr 2-2 radio from Kantronics. If your radio requires a different level of drive, you can move jumper J3 to the low position (center pin and pin L) to provide 10 mv p-p, or you can remove jumper J3 to provide 2 volts p-p of audio drive. If none of the factory jumper settings provide the proper drive level for your radio, you may install a 10K potentiometer at R18 to allow adjustment from about 10 millivolts to 200 millivolts p-p. You may optionally remove resistor R16 (100K ohm) and install a 100K ohm potentiometer at R18, allowing adjustment of the audio output from 10 millivolts p-p to a maximum of 2 volts p-p.

If you are connecting the DE1200 modem to a hand-held radio, refer to the section on "Interfacing the DE1200 to Hand-Held Radios" in this manual.

Equalization

There are three jumper-selectable equalization positions available, allowing optimum performance with your radio. The unit is shipped from the factory with NO EQUALIZATION selected (jumper J1 on the center post and N). Partial equalization can be selected by placing the jumper on the center post and P, and full equalization is selected by removing the jumper. If you are using audio directly from the discriminator of your radio, no equalization is the required setting. For those using audio from the external speaker jack, you may need to select partial or full equalization. The best selection will be determined by observing the retries over a period of time, and the fewest retries indicates the correct setting.

Interfacing the DE1200 to Hand-Held Radios

The DE1200 modem is shipped ready to connect to most mobile or base radios. If you are planning to use a hand-held radio, jumper J2 should be moved to connect the center pin with the pin marked HT. In some cases, you will require a different value of resistor in the Push-to-Talk circuit as described below.

ICOM hand-helds (2AT, 02AT, 2GAT, etc)

Move jumper J2 to the HT position. Next connect the following pins from the DB-15 to your HT as listed:

DB-15	Connect to
1	No connection
2	Earphone jack tip
3	Microphone jack tip
8	No connection
9	No connection
10	No connection
11	Earphone jack shell

Kenwood hand-helds (TR-2500, TR-2600, 215, etc)

DB-15	Connects to
1	Microphone jack shell
2	Earphone jack tip
3	Microphone plug ring (3 pin connector – not the tip)
8	No connection
9	No connection
10	No connection
11	Earphone jack shell

Yaesu hand-helds (FT 727, 470, etc)

These radios use the same connection as the ICOM hand-helds, but the PTT keying resistor will need to be changed. To perform this modification, install a 1.8K ohm resistor in R13 on the DE1200 board. This is located just to the right of the J2 jumper.

DB-15	Connects to
1	No connection
2	Earphone jack tip
3	Microphone jack tip
8	No connection
9	No connection
10	No connection
11	Earphone jack shell

Other hand-helds

Most other hand-held radios use a similar connection.

When jumper J2 is on the center pin and the pin marked NOR, the AFSK output from the modem is connected to ground through a 10K ohm resistor. This will cause many hand-held radios to key the transmitter. Moving the jumper to the center pin and HT, will cause the resistor to be isolated from ground except when the Data Engine asserts Push-To-Talk.

Our experience with hand-helds has indicated that the PTT resistor value is the only change required for most hand-helds, and you can experiment by installing different values in R13.

Watchdog Timer

The DE1200 modem has a watchdog timer built in to prevent your radio from remaining in a transmit state for more than approximately 2-1/2 minutes. If you need to disable the watchdog timer, place jumper J4 on both pins. Kantronics recommends that the watchdog timer not be disabled.

Data Carrier Detect

The DE1200 modem supports 3 methods of providing DCD to the Data Engine. These are selected by using the MODEM command on your Data Engine.

MODEM 0 selects the DE1200 sine-wave carrier detect. In this mode, the DE1200 will indicate carrier detect when a signal is received which has audio sine-wave components (i.e. packet tones). This type of carrier detect will not prevent the Data Engine from transmitting when only noise or voice is present on the frequency, allowing the Data Engine to be used with un-squelched audio.

MODEM 1 selects the carrier detect from the 3105 modem chip. In this mode of operation, any energy present on the frequency will cause the DE1200 to signal carrier detect to the Data Engine, blocking transmission. This would be useful for a shared voice/data channel when it is desirable to withhold packet transmission while voice is being used. This carrier detect cannot be used with un-squelched audio.

MODEM 2 selects the external carrier detect. This mode requires some external device to supply a signal to pin 8 of the DB-15 connector (pin 12 on the DE1200 external modem header). You may choose to have your radio supply the squelch signal (ground active), or you may have some external circuitry provide a carrier detect.

The DE1200 modem also has provisions for one additional Carrier Detect to be connected to the modem at the pad marked PD1. This pad is located just back and right of the crystal. A high (+5 volts) will signal active carrier detect at this point, and a ground will signal that the channel is clear. This input is selected with the command MODEM 3.

The carrier detect threshold is set at the factory and should require no adjustment under normal circumstances. If you find it necessary to adjust the threshold, install a 10K ohm potentiometer at R76. This potentiometer will then adjust the CD threshold.

V.23 Modification

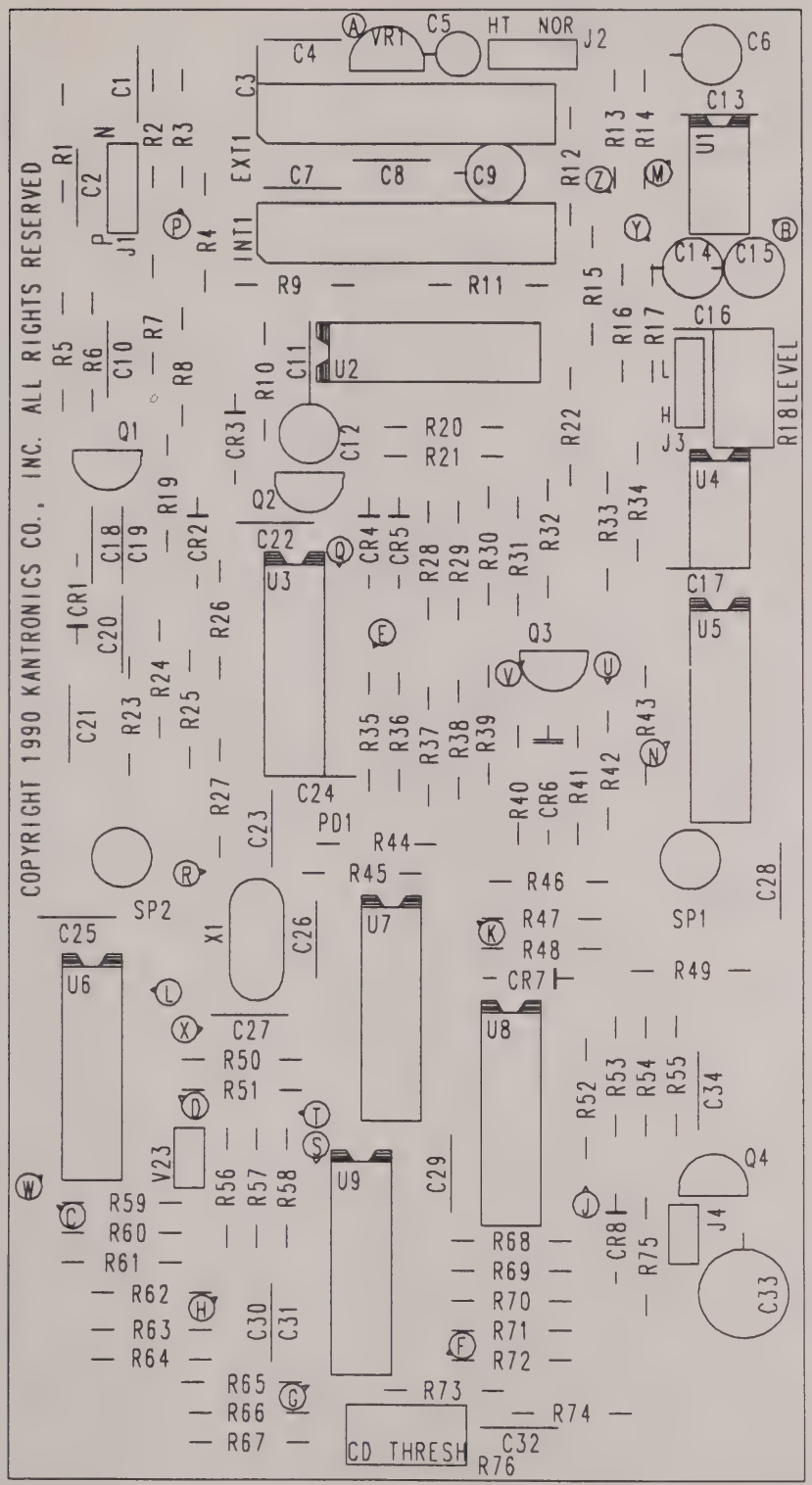
The DE1200 modem supports V.23 operation. In order to select V.23, install a jumper on the modem board at the pads marked V23. These pads are located just to the right of U6.

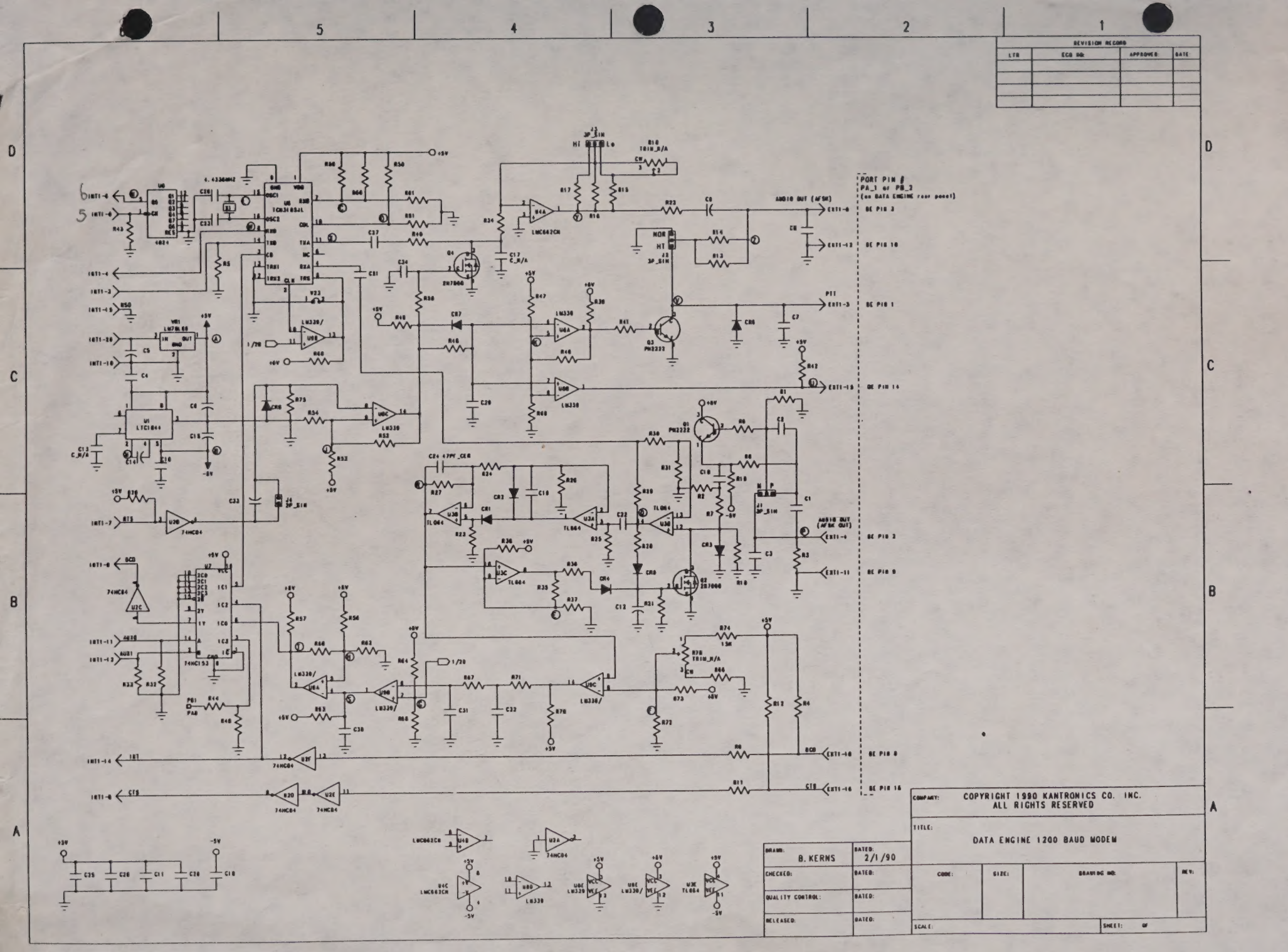
Selecting V.23 operation will cause the modem to use 1300 Hz for Mark and 2100 Hz for Space instead of the standard Bell 202 tones.

DE1200 Parts List

C1	.001uF	R1	100K	R55	47K
C2	.001uF	R2	4.7K	R56	10K
C3	.01uF	R3	620	R57	10K
C4	.1uF	R4	10K	R58	470K
C5	1uF_AL	R5	100K	R59	8.45K_1%
C6	1uF_AL	R6	2.2K	R61	10K
C7	.001uF	R7	33K	R62	6.8K
C8	.001uF	R8	47K	R63	470K
C9	1uF_AL	R9	100K	R64	10K
C10	.1uF	R11	100K	R65	6.8K
C11	.1uF	R12	10K	R66	4.7K
C12	1uF_AL	R14	10K	R67	47K
C14	10uF_AL_35V	R15	470	R68	10K
C15	10uF_AL_35V	R16	100K	R69	10K
C16	.1uF	R17	2.7K	R70	2.2K
C18	.1uF	R19	4.7K	R71	47K
C19	20pF	R20	100K	R72	39K
C20	.1uF	R21	1M	R73	100K
C21	.1uF	R22	620	R74	15K
C22	.01uF	R23	100K	R75	1M
C23	20pF	R24	10K	U1	LTC1044
C24	47pF	R25	22K	U2	74HC04
C25	.1uF	R26	12K_1%	U3	TL064
C26	20pF	R27	100K	U4	LMC662CN
C27	.1uF	R29	9.1K	U5	4024
C28	.1uF	R30	1K	U6	TCM3105JL
C29	.1uF	R31	100	U7	74HC153
C30	.1uF	R32	100K	U8	LM339
C31	.1uF	R33	100K	U9	LM339
C32	.1uF	R34	10K	VR1	LM78L05
C33	47uF_AL	R35	22K	X1	4.4336MHZ
C34	.1uF	R36	4.7K		
CR1	1N914	R37	10K		
CR2	1N914	R38	5.6K		
CR3	1N914	R39	2.2K		
CR4	1N914	R40	82K		
CR5	1N914	R41	2.2K		
CR6	1N4003	R42	4.7K		
CR7	1N914	R43	100K		
CR8	1N914	R44	10K		
EXT1	20P_DIHS	R45	100K		
INT1	20P_DIHS	R46	220K		
J1	3P_SIH	R47	10K		
J2	3P_SIH	R48	100K		
J3	3P_SIH	R49	10K		
J4	2P_SIH	R50	9.1K		
Q1	PN2222	R51	33K		
Q2	2N7000	R52	100K		
Q3	PN2222	R53	10K		
Q4	2N7000	R54	1K		

DE1200 Parts Location




REVISION RECORD
LTR
ECO NO:
APPROVED:
DATE
PORT PIN #
PA_1 or PB_2
(on DATA ENGINE rear panel)
AUDIO OUT (AFSK)
PTT
AUDIO OUT (AFSK OUT)
DCD
CTS
DE PIN 3
DE PIN 10
DE PIN 1
DE PIN 14
DE PIN 2
DE PIN 9
DE PIN 8
DE PIN 15
COMPANY:
COPYRIGHT 1990 KANTRONICS CO. INC.
ALL RIGHTS RESERVED
TITLE:
DATA ENGINE 1200 BAUD MODEM
DRAWN:
B. KERNS
DATED:
2/1/90
CHECKED:
QUALITY CONTROL:
RELEASED:
CODE:
SIZE:
DRAWING NO:
REV:
SCALE:
SHEET: